8-channel yearly time switches
TR 648 top2 RC KNX
TR 648 top2 RC-DCF KNX

TR 648 top2 RC KNX	6489212
TR 648 top2 RC-DCF KNX	6489210

Contents

1 Functional characteristics

- 8 channels
- 800 switching times
- 15 weekly programs
- Daily, weekly and yearly program
- 16 special programs including Continuous ON / continuous OFF available via object
- 2 random programs
- Astronomical switching program
- ON-OFF switching times, pulse program, cycle program
- Automatic changeover summer/winter time
- Text-based operator guidance

1.1 Special features

- Can be used without mains/bus connection
- Plug-in switching program
- **DCF** via data bus
- **GPS** via data bus (only 6489212)
- Programming also possible via the KNX bus (see attachment)
- Global time synchronisation (only 6489212 + GPS receiver)
- Global positioning (only 6489212 + GPS receiver)
- 8 year power reserve
- Each channel can be operated either with **time switch** function or with **astro** function.
- Two sending objects per channel
- Joint data bus connection for Luna 134 sensors and TR 648 top2 receiver possible (see figure).

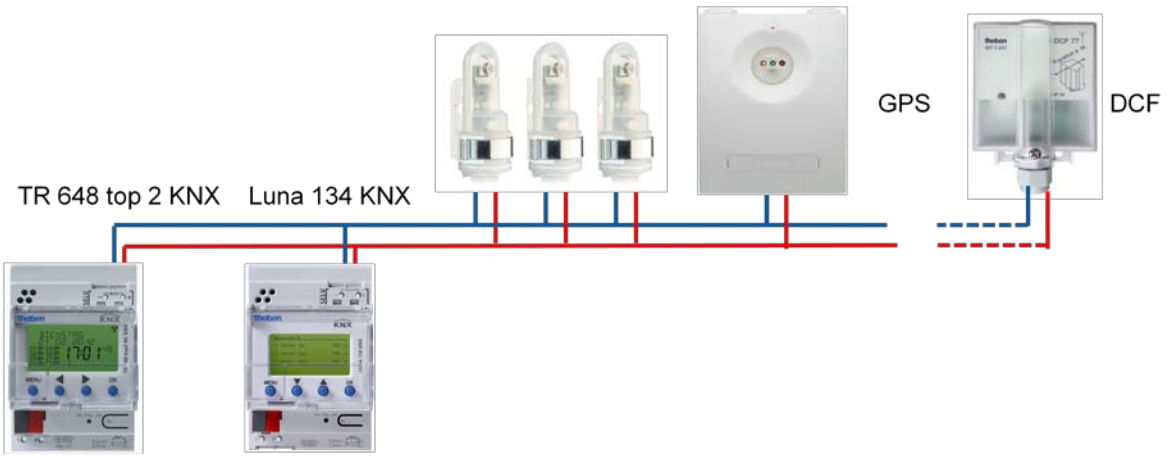

Figure 1

2 Technical data

Operating voltage KNX	Bus voltage, ≤ 12 mA
Operating voltage	110–240 V AC
Frequency	50 - 60 Hz
Power consumption	typ. 1 W
Standby output	min. 0.8 W
Width	3 module
Connection type	KNX bus terminal
Max. cable cross-section	2.5 mm²
Installation type	DIN-rail
Number of channels	8
Number of memory locations	800
Time accuracy	≤ ± 0.5 s/day(Quartz) or DCF77/GPS
Shortest switching time	1 s
Display	LCD
Ambient temperature	-5 °C … +45 °C
IP rating	IP 20
Protection class	II in accordance with EN 60 730-1

3 The application program "TR 648 top2 RC"

3.1 Selection in the product database

Manufacturer	Theben AG
Product family	Time switches
Product type	8-channel yearly clock switch
Program name	TR 648 top2 RC V1.0

The ETS database can be found on our downloads page: www.theben.de/en/downloads_en

Table 1

Number of group addresses:	254
Number of associations:	255
Number of communication objects:	121

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3.2 Communication objects

Table 2

No.	Object name	Function	Type DPT	Flags			
0	*Local time*	*transmit*	3 byte 10,001	C	R	-	T
		Receive	3 byte 10,001	C	R	W	-
1	*Local date*	*transmit*	3 byte 11,001	C	R	-	T
		Receive	3 byte 11,001	C	R	W	-
2	*UTC time*	*transmit*	3 byte 10,001	C	R	-	T
3	*UTC date*	*transmit*	3 byte 11,001	C	R	-	T
4	*Time query*	*transmit*	1 bit 1,001	C	R	-	T
		Receive	1 bit 1,001	C	R	W	-
5	*Error GPS module*	*0 = OK, 1 = Error*	1 bit 1,001	C	R	-	T
6	*Date/time (DPT 19.001)*	*transmit*	8 byte 19,001	C	R	-	T
		Receive	8 byte 19,001	C	R	W	-

Continuation:

No.	Object name	Function	Type DPT	Flags			
7	*C1.1 switching channel*	*Switching*	1 bit 1,001	C	R	-	T
		priority	2 bit 2,001	C	R	-	T
		Value	1 byte 5,010	C	R	-	T
		Percent	1 byte 5,001	C	R	-	T
		HVAC operating mode	1 byte 20,102	C	R	-	T
		Temperature in °C	2 byte 9,001	C	R	-	T
		Temperature in C	2 byte 9,002	C	R	-	T
		scene	1 byte 18,001	C	R	-	T
8	*C1.2 switching channel*	*Switching*	1 bit 1,001	C	R	-	T
		Value	1 byte 5,010	C	R	-	T
		Percent	1 byte 5,001	C	R	-	T
		HVAC operating mode	1 byte 20,102	C	R	-	T
		Temperature in °C	2 byte 9,001	C	R	-	T
		Temperature in C	2 byte 9,002	C	R	-	T
9	*C1 lock*	*Lock = 1*	1 bit 1,003	C	R	W	-
		Lock = 0	1 bit 1,003	C	R	W	-
10	*C1 switching channel*	*Special program*	1 byte 5,010	C	R	W	-
11	*C1 switching channel*	*Operating hours feedback*	2 byte 7,001	C	R	-	T
		Time to next service	2 byte 7,001	C	R	-	T
12	*C1 switching channel*	*Service required*	1 bit 1,001	C	R	-	T
13	*C1 switching channel*	*Reset operating hours*	1 bit 1,001	C	R	W	-
		Reset service	1 bit 1,001	C	R	W	-
14-62	Switching channels C2..C8						

Continuation:

No.	Object name	Function	Type DPT	Flags			
63	*C9 threshold switch input*	*0..65535*	2 byte 7,001	C	R	W	-
		EIS 5	2 byte 9.*	C	R	W	-
		Percent	1 byte 5,001	C	R	W	-
		0..255	1 byte 5,010	C	R	W	-
64	*C9 lock*	*Lock = 1*	1 bit 1.001	C	R	W	-
		Lock = 0	1 bit 1.001	C	R	W	-
65	*C9.1 threshold switch input*	*Switching*	1 bit 1.001	C	R	-	T
		Value	1 byte 5,010	C	R	-	T
		priority	2 bit 2,001	C	R	-	T
66	*C9.2 threshold switch input*	*Switching*	1 bit 1.001	C	R	-	T
		Value	1 byte 5,010	C	R	-	T
		priority	2 bit 2,001	C	R	-	T
67-78	Threshold channels C10..C12						
79	*C13 Logic module*	*Logic input 1 in AND/OR/XOR gate*	1 bit 1,001	C	R	W	-
80		*Logic input 2 in AND/OR/XOR gate*	1 bit 1,001	C	R	W	-
81		*Logic input 3 in AND/OR gate*	1 bit 1,001	C	R	W	-
82		*Logic input 4 in AND/OR gate*	1 bit 1,001	C	R	W	-
83	*C13 Logic module*	*Lock = 0*	1 bit 1,001	C	R	W	-
		Lock = 1	1 bit 1,001	C	R	W	-

Continuation:

No.	Object name	Function	Type DPT	Flags			
84	*C13.1 Logic module*	*Switching*	1 bit 1.001	C	R	-	T
		Value	1 byte 5,010	C	R	-	T
		priority	2 bit 2,001	C	R	-	T
85	*C13.2 Logic module*	*Switching*	1 bit 1.001	C	R	-	T
		Value	1 byte 5,010	C	R	-	T
		priority	2 bit 2,001	C	R	-	T
86-120	C14..C18, see below						

Table 3: Objects for the switching channels

C1	C2	C3	C4	C5	C6	C7	C8
7	14	21	28	35	42	49	56
8	15	22	29	36	43	50	57
9	16	23	30	37	44	51	58
10	17	24	31	38	45	52	59
11	18	25	32	39	46	53	60
12	19	26	33	40	47	54	61
13	20	27	34	41	48	55	62

Table 4: Objects for the threshold channels

C9	C10	C11	C12
63	67	71	75
64	68	72	76
65	69	73	77
66	70	74	78

Table 5: Objects for the logic channels

C13	C14	C15	C16	C17	C18
79	86	93	100	107	114
80	87	94	101	108	115
81	88	95	102	109	116
82	89	96	103	110	117
83	90	97	104	111	118
84	91	98	105	112	119
85	92	99	106	113	120

3.2.1 Description of objects

3.2.1.1 Time and date

- **Object 0 "*local time*"**

As a transmission object:
Sends the current time in DPT 10.001 format, depending on the configuration: only on request, cyclically or at specific times (see "*Send time and date*" parameter).

As a receive object:
Used to set the time via the bus.

- **Object 1"*Local date*"**

As a transmission object (send date):
Sends the current date in DPT 11.001 format, depending on the configuration: only on request, cyclically or at specific times.

As a receive object (receive date):
Used to set the date via the bus:

- **Object 2"UTC time"**

World time (*Coordinated Universal Time)* i.e. Basis for the calculation of the different time zones.
Corresponds to the time at the Greenwich meridian.

CET (Central European Time) = UTC + 1 h
CEST (Central European Summer Time) = UTC + 2 h.

UTC time is only sent and not received.

- **Object 3 "UTC date"**

World date corresponds to the date at the Greenwich meridian.

UTC date is only sent and not received.

- **Object 4 *"*Time query*"***

Table 6

Mode of operation of object, time and date	Data orientation
receive time and date	Object sends time query to bus clock switch, e.g. ZS 600 DCF (order no. 6009200) to receive the current time.
send time and date	Object receives time query from other bus participants and initiates transmission process for time and date objects.

- **Object 5 "E DCF/GPS module"**

Sends a 1 (after one hour) if the DCF or GPS module is defective or unavailable.
0 = No error.

- **Object 6 "Date / time (DPT 19.001)"**

As a transmission object:
Sends the date and current time together as an 8 byte telegram depending on the configuration: only on request, cyclically or at specific times (see "*Send time and date*" parameter).

As a receive object:
Used to set the time and date via the bus.

3.2.1.2 Switching channels C1..C10

- **Objects 7 "C1.1, switching channel, switching, priority, valuator, per cent, HVAC operating mode, temperature in °C, temperature in K, scene"**

This is the first output object of a switching channel.
The function of the object depends upon the selected telegram type
(see parameter page *switching channel C1*, parameter *telegram type C1.1*).

Table 7

<table>
<tr><th>Telegram type</th><th>format</th><th>Sent telegrams</th></tr>
<tr><td>switching command</td><td>DPT 1.001 (On/Off)</td><td>On / Off</td></tr>
<tr><td>priority</td><td>DPT 2.001 (priority control)</td><td>2-bit telegram:
<table>
<tr><th>Function</th><th>value</th></tr>
<tr><td>no priority (no control)</td><td>0</td></tr>
<tr><td>Priority OFF (control: disable, off)</td><td>2</td></tr>
<tr><td>Priority ON (control: enable, on)</td><td>3</td></tr>
</table></td></tr>
<tr><td>value</td><td>DPT 5.010</td><td>Value between 0 and 255</td></tr>
<tr><td>percentage value</td><td>DPT 5.001</td><td>Percentage value 0..100%</td></tr>
<tr><td>HVAC operating mode</td><td>DPT 20.102</td><td>Send HVAC operating mode.
<table>
<tr><th>value</th><th>Operating mode</th></tr>
<tr><td>1</td><td>comfort</td></tr>
<tr><td>2</td><td>standby</td></tr>
<tr><td>3</td><td>Night</td></tr>
<tr><td>4</td><td>Frost protection/heat protection</td></tr>
</table></td></tr>
<tr><td>Temperature [°C]</td><td>DPT 9.001</td><td>Absolute temperature in °C
(0..100 °C)</td></tr>
<tr><td>Temperature differential [K]</td><td>DPT 9.002</td><td>Relative temperature in K
(-50..50 K)</td></tr>
<tr><td>scene</td><td>DPT</td><td>Scene numbers 1..64</td></tr>
</table>

- **Object 8 "C1.2 switching channel, switching, priority, valuator, per cent, HVAC operating mode, temperature in °C, temperature in K"**

This is the second output object of a switching channel
The function of the object depends upon the selected telegram type
(see parameter page *switching channel C1*, parameter *telegram type C1.2*).

The telegram type can be configured independently of the first output object.

Table 8

<table>
<tr><th>Telegram type</th><th>format</th><th>Sent telegrams</th></tr>
<tr><td>switching command</td><td>DPT 1.001 (On/Off)</td><td>On / Off</td></tr>
<tr><td>value</td><td>DPT 5.010</td><td>Value between 0 and 255</td></tr>
<tr><td>percentage value</td><td>DPT 5.001</td><td>Percentage value 0..100%</td></tr>
<tr><td>HVAC operating mode</td><td>DPT 20.102</td><td>Send HVAC operating mode.
<table>
<tr><th>value</th><th>Operating mode</th></tr>
<tr><td>1</td><td>comfort</td></tr>
<tr><td>2</td><td>standby</td></tr>
<tr><td>3</td><td>Night</td></tr>
<tr><td>4</td><td>Frost protection/heat protection</td></tr>
</table></td></tr>
<tr><td>Temperature [°C]</td><td>DPT 9.001</td><td>Absolute temperature in °C</td></tr>
<tr><td>Temperature differential [K]</td><td>DPT 9.002</td><td>Relative temperature in K</td></tr>
</table>

The cycle time and the disabling behaviour are apply to both objects (objects 7+8).

- **Object 9 "Disable C1"**

Only available if the disable function is activated.

The behaviour when setting/cancelling the block and the acting direction can be selected on the *disable function* parameter page.

- **Object 10 "C1 switching channel, special program"**

Each special program can be activated via the object.
The number of the required is sent for this.
The special program is switched off with program number 0 (standard program active).
The switching times of the special programmes have to be created with the Obelisk program.
There are no standard templates.
Special programs have a higher priority than the standard program and the higher the number, the higher priority

0 = End special program/no special program (i.e. standard program).
1-14 = Calls up the corresponding special program.
15 = Special program Continuous ON.
16 = Special program Continuous OFF.

Note: If a special program is activated via the "Menu/program" push button rather than via the object, the object will not be updated *or displayed onscreen.*

- **Object 11 "***Time to next service, operating hours feedback* **"**

Only available if the operating hours counter function is activated
Reports, depending on selected *type of operating hours counter*, either the remaining time to end of set service interval or the current status of the operating hours counter.

- **Object 12 "***Service required***"**

Only available if the operating hours counter function has been activated
and *type of operating hours counter = counter for time to next service.*

Reports if the next service is due.
0 = not due
1 = service is due.

- **Object 13 "***Reset service, reset operating hours***"**

Only available if the operating hours counter function is activated

Function	Use
*Reset service**	Reset service interval counter. 1 = Reset
*Reset operating hours**	Reset operating hours counter 1 = Reset

* Depending on configuration.

- **Objects 14..62**

Objects 14 to 62 are for the switching channels C2..C10 and are identical in their function to the objects on channel C1.

3.2.1.3 Threshold switches C9..C12

- **Object 63** *"C9 threshold switch input"*

Channel input object, this object activates the set channel function.

Type of threshold value object	Activation of channel function via
object type: Per cent (DPT 5.001)	Exceeding per cent value
Object type: Counter value 0..255 (DPT 5.010)	Any value in given numerical range
object type: Counter value 0..65535 (DPT 7.001)	
Object type: EIS5 e.g. CO2, brightness (DPT 9.xxx)	2 byte floating-point number

- **Object 64** *"C9 disable"*

Channel disable object.
Only visible if the disable function is activated.
The acting direction (disable with 0 or 1) can be set via parameter.

- **Object 65** *"C9.1 threshold switch, switch/valuator/ priority"*

This is the first output object of the threshold switch.
The function of the object depends upon the selected telegram type
(see *Objects* parameter page, *telegram type C9.1* parameter).

Table 9

<table>
<tr><th>Telegram type</th><th>format</th><th>Sent telegrams</th></tr>
<tr><td>Switching</td><td>DPT 1.001 (On/Off)</td><td>On / Off</td></tr>
<tr><td>priority</td><td>DPT 2.001 (priority control)</td><td>2-bit telegram:
<table>
<tr><td>Function</td><td>value</td></tr>
<tr><td>no priority (no control)</td><td>0</td></tr>
<tr><td>Priority OFF (control: disable, off)</td><td>2</td></tr>
<tr><td>Priority ON (control: enable, on)</td><td>3</td></tr>
</table></td></tr>
<tr><td>value</td><td>DPT 5.010</td><td>Value between 0 and 255</td></tr>
</table>

- **Object 66** *"C9.2 threshold switch, switching/valuator/priority"*

This is the second output object of the threshold switch.
The function of the object depends upon the selected telegram type
(see *Objects* parameter page, *telegram type C9.2* parameter).

The telegram type can be configured independently of the first output object.
The same setting options are available for this purpose as for the first output object
(see table above for object 65).

The cycle time and the disabling behaviour are apply to both objects (objects 65+66).

- **Objects 67..78**

Objects 67 to 78 are for the switching channels C10/C12 and are identical in their function to the objects on channel C9.

3.2.1.4 Logic modules C13..C18

- **Object 79** *"C13 logic module, logic input 1 in AND/OR/XOR gate"*

First input object of the logic module.

- **Object 80** *"C13 logic module, logic input 2 in AND/OR/XOR gate"*

Second input object of the logic module.

- **Object 81** *"C13 logic module, logic input 3 in AND/OR gate"*

Third input object of the logic module.
Not used with XOR link.

- **Object 82** *"C13 logic module, logic input 4 in AND/OR gate"*

Fourth input object of the logic module.
Not used with XOR link.

- **Object 83** *"C13 logic module, disable"*

Channel disable object.
Only visible if the disable function is activated.
The acting direction (disable with 0 or 1) can be set via parameter.

- **Object 84** *"C13.1 logic module, switch/valuator/priority"*

This is the first output object of the logic module.
The function of the object depends upon the selected telegram type
(see *Objects* parameter page, *telegram type C13.1* parameter).

Table 10

<table>
<tr><th>Telegram type</th><th>format</th><th>Sent telegrams</th></tr>
<tr><td>Switching</td><td>DPT 1.001 (On/Off)</td><td>On / Off</td></tr>
<tr><td>priority</td><td>DPT 2.001 (priority control)</td><td>2-bit telegram:
<table>
<tr><td>Function</td><td>value</td></tr>
<tr><td>no priority (no control)</td><td>0</td></tr>
<tr><td>Priority OFF (control: disable, off)</td><td>2</td></tr>
<tr><td>Priority ON (control: enable, on)</td><td>3</td></tr>
</table></td></tr>
<tr><td>value</td><td>DPT 5.010</td><td>Value between 0 and 255</td></tr>
</table>

- **Object 85** *"C13.2 logic module, switch/valuator/priority"*

This is the second output object of the logic module
The function of the object depends upon the selected telegram type
(see *Objects* parameter page, *telegram type C13.2* parameter).

The telegram type can be configured independently of the first output object.
The same setting options are available for this purpose as for the first output object
(see table above for object 84).

The cycle time and the disabling behaviour are apply to both objects (objects 84+85).

- **Objects 86..120**

Objects 86 to 120 are for the logic modules C13/C18 and are identical in their function to the objects on channel C13.

3.3 Parameter

3.3.1 Parameter pages

Table 11

Function	Description
General	Selection of required channels
Date and time	Settings for transmission/reception of time/date and selection of antenna.
Switching channel C1: Function .. Switching channel C10: Function	Telegram type and reaction when clock is switched on and off.
Locking function	Response to disable telegrams
Catch up switching times	Reaction after restoration of bus, changing time, programming of switching times etc.
Threshold channel C9: Function .. Threshold channel C12: Function	Type of threshold value object, delays etc.
Objects	Telegram type, switching and disable response etc.
Logic channel C13: Function .. Logic channel C18: Function	Number of inputs, links etc.
Objects	Telegram type, switching and disable response etc.

3.3.2 Parameter description

Settings that lead to the display of other pages or functions are identified by ...
Example: *yes../no*

3.3.2.1 The "General" parameter page

Table 12

Designation	*Values*	Description
Activate switching channel C1	***No*** *Yes..*	The switching channels can issue telegrams when clock is switched on or off.
Activate switching channel C2	***No*** *Yes..*	
Activate switching channel C3	***No*** *Yes..*	
Activate switching channel C4	***No*** *Yes..*	
Activate switching channel C5	***No*** *Yes..*	
Activate switching channel C6	***No*** *Yes..*	
Activate switching channel C7	***No*** *Yes..*	
Activate switching channel C8	***No*** *Yes..*	
Activate switching channel C9	***No*** *Yes..*	
Activate switching channel C10	***No*** *Yes..*	

3.3.2.2 The "Date and time" parameter page

Table 13

Designation	Values	Description
Mode of operation of object, time and date	***send time and date***	If "send' is selected, the clock can send the current time and date to the bus cyclically and on request.
	receive time and date	If "receive" is selected, the clock can be reset via external time and date telegrams.
Parameter for *send time and date*		
send time and date	*on request* *every minute* ***every hour*** *every day at midnight and at summer/winter changeover* *Every day at 00:02 and at summer/winter changeover*	Setting, when for example how often time and date should be sent. Note: Sending can be initiated at anytime via the "time query' object.
Type of antenna	***None*** *GPS (only 6489212)* *DCF 77*	 The exact time is acquired via an external receiver module.
Parameter for r*eceiving time and date*		
Format of time and date telegrams	*standard (DPT 10.001 + DPT 11.001)* *data point Date Time (8 Byte, DPT 19.001)*	Time and date received separately at objects 0 and 1. Receive time and date together as an 8 byte telegram on object 6.
Send time request	*Do not send* *every hour* *every 2 hours* *every 3 hours* *every 6 hours* *every 12 hours*	If GPS or DCF modules are not used: How often should a time query be sent to the bus?

3.3.2.3 The parameter pages "switching channel C1..C10: Function"

The switching channels are activated on the general parameter page.
Different parameters are available according to the set functions.

Table 14

<table>
<tr><th>Designation</th><th>Values</th><th>Description</th></tr>
<tr><td>Telegram type C1.1</td><td>Switching command</td><td>1 bit ON/OFF</td></tr>
<tr><td></td><td>Priority</td><td>2-bit
<table>
<tr><th>Function</th><th>value</th></tr>
<tr><td>Priority inactive (no control)</td><td>0 (00_{bin})</td></tr>
<tr><td>Priority ON (control: enable, on)</td><td>3 (11_{bin})</td></tr>
<tr><td>Priority OFF (control: disable, off)</td><td>2 (10_{bin})</td></tr>
</table></td></tr>
<tr><td></td><td>value</td><td>Value between 0 and 255</td></tr>
<tr><td></td><td>percentage value</td><td>Percentage value 0..100%</td></tr>
<tr><td></td><td>HVAC operating mode</td><td>Send HVAC operating mode.
<table>
<tr><th>value</th><th>Operating mode</th></tr>
<tr><td>1</td><td>comfort</td></tr>
<tr><td>2</td><td>standby</td></tr>
<tr><td>3</td><td>Night</td></tr>
<tr><td>4</td><td>Frost protection/heat protection</td></tr>
</table></td></tr>
<tr><td></td><td>Temperature (°C)</td><td>Absolute temperature in °C (0..100)</td></tr>
<tr><td></td><td>Temperature differential [K]</td><td>Relative temperature in K (-50..50)</td></tr>
<tr><td></td><td>scene</td><td>Scene numbers 1..64</td></tr>
<tr><td>With clock → ON</td><td>no telegram
send following telegram once
send cyclically</td><td>Transmission response when the channel is switched on.</td></tr>
</table>

Continuation:

Designation	Values	Description
Telegram		Type of telegram for the first output with channel switched on
	ON	For telegram type *Switching command*.
	OFF	
	no priority	For telegram type *Priority*.
	priority, ON (down)	
	priority, OFF (up)	
	Telegram 0 .. ***255***	For telegram type *Value*.
	*0..**100***	For telegram type *Percentage value*
	comfort	For telegram type *HVAC operating mode*
	Standby	
	temperature reduction at night	
	frost and heat protection modes	
	0..100	For telegram type *Temperature (°C)*
	-50..50	For telegram type *Temperature differential (K)*
	1..64	For telegram type Scene
As with clock → OFF	*no telegram*	Transmission response if the channel is switched off.
	send following telegram once	
	send cyclically	

Continuation:

Designation	Values	Description
Telegram		Type of telegram for the first output object with channel switched off.
	ON	For telegram type *Switching command*.
	OFF	
	no priority	For telegram type *Priority*.
	priority, ON (down)	
	priority, OFF (up)	
	Telegram 0 .. ***255***	For telegram type *Value*.
	*0..**100***	For telegram type *Percentage value*
	comfort	For telegram type *HVAC operating mode*
	Standby	
	temperature reduction at night	
	frost and heat protection modes	
	0..100	For telegram type *Temperature (°C)*
	-50..50	For telegram type *Temperature differential (K)*
	1..64	For telegram type Scene
Should a second telegram be sent?	*Yes*	If yes is selected, further parameters and a second transmission object appear. It can be used to send 2 different telegrams at the same time on the same channel. The cycle time and the disabling behaviour apply to both objects.
	no	

Continuation:

<table>
<tr><th>Designation</th><th>Values</th><th>Description</th></tr>
<tr><td>Telegram type C1.2</td><td>switching command
value
percentage value
HVAC operating mode

Temperature (°C)
Temperature differential [K]</td><td>1 bit ON/OFF
Value between 0 and 255
Percentage value 0..100%
Send HVAC operating mode.<table><tr><th>value</th><th>Operating mode</th></tr><tr><td>1</td><td>comfort</td></tr><tr><td>2</td><td>standby</td></tr><tr><td>3</td><td>Night</td></tr><tr><td>4</td><td>Frost protection/heat protection</td></tr></table>
Absolute temperature in °C
Relative temperature in K</td></tr>
<tr><td>With clock → ON</td><td>no telegram
send following telegram once
send cyclically</td><td>Transmission response when the channel is switched on.</td></tr>
<tr><td>Telegram</td><td>
ON
OFF

Telegram 0 .. 255

0..100

comfort
Standby
temperature reduction at night
frost and heat protection modes

0..100

-50..50</td><td>Type of telegram for the second output with channel switched on.
For telegram type Switching command.

For telegram type Value.

For telegram type Percentage value

For telegram type HVAC operating mode

For telegram type Temperature (°C)

Temperature differential [K]</td></tr>
<tr><td>As with clock → OFF</td><td>no telegram
send following telegram once
send cyclically</td><td>Transmission response if the channel is switched off.</td></tr>
</table>

Continuation:

Designation	Values	Description
Telegram		Type of telegram for the second output object with channel switched off
	ON	For telegram type Switching command.
	OFF	
	Telegram 0 .. 255	For telegram type Value.
	0..100	For telegram type Percentage value
	comfort *Standby* *temperature reduction at night* *frost and heat protection modes*	For telegram type HVAC operating mode
	0..100	For telegram type Temperature (°C)
	-50..50	Temperature differential [K]
Activate lock function	*Yes*	Insert disable parameter and disable object.
	no	No disable function.
Activate operating hours counter	***no*** *yes..*	Is the *operating hours counter/ service interval* function to be used?
Cycle time (if used)	*every min* *every 2 min* *every 3 min* *every 5 min* *every 10 min* *every 15 min* *every 20 min* *every 30 min* *every 45 min* ***every 60 min***	How often should the telegrams for CX.1 and CX.2 be sent?

3.3.2.4 Parameter pages "Disable function"

The disable function is activated on the switching channel C1 parameter page.
Different parameters are available according to the set functions.

Table 15

Designation	Values	Description
Lock telegram	***Disable with ON telegram***	1 = Disable 0 = Cancel disable
	lock with OFF telegram	1 = Cancel disable 0 = Disable*
Response when setting disable	***do not send***	No telegrams when setting disable
	as with clock → ON	Same reaction set as with parameter for clock → ON (see above, *the parameter pages "switching channel C1..C10: Function"*).
	as with clock → OFF	Same reaction set as with parameter *for clock → OFF* (see above, *the parameter pages "switching channel C1..C10: Function"*).
Behaviour when cancelling the disable function	*do not send*	Not automatically resent when the disable function is cancelled
	update channel	The current channel status is sent immediately as soon as the disable function is cancelled

*After reset/download: Disable function only active after the disable object has received a 0.

3.3.2.5 The "*Operating hours counter and service* parameter page"

This page appears when *Activate operating hours counter* is selected on the *Switching channel Cx* parameter page.

Table 16

Designation	Values	Description
Type of operating hours counter	***operating hours counter***	Forward counter for channel power-on time.
	counter for time period before next service	Backward counter for channel power-on time.
operating hours counter		
Reporting of changes to operating hours (0..100 h, 0 = no report)	*0..100* *Default value = **10***	At what interval is the current counter status to be sent? Example: 10 = Send each time the counter status increases by another 10 hours.
Report operating hours cyclically	***No*** *yes*	Send at regular intervals?
Time for cyclical transmission	*2 minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes, 45 minutes* ***60 minutes***	At what interval?
counter for time period before next service		
Service interval (1..32767)	*1.. 32767* *Default value = 100*	Desired timescale in hours between two services.
Reporting of changes to time to service (0..100 h, 0 = no report)	*0..100* *Default value = **10***	At what interval is the current counter status to be sent? Example: 10 = Send each time the counter status decreases by another 10 hours.
Report time to service cyclically	***no*** *Yes*	Send **remaining** time to next service at regular intervals? → Object *Time to next service*.
Report service cyclically	***no*** *Yes*	**Required service** (1 bit) send at regular intervals? → Object *Service required.*
Tine for cyclical transmission (time to service and service	*2 minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes, 45 minutes* ***60 minutes***	At what interval?

3.3.2.6 Parameter pages "Catch up switching times"

This determines whether the current channel status should be resent (telegram repeat) after certain events, (bus restoration, changes to the program memory etc.).
Resending the current channel status is generally worthwhile but may not be required in certain applications.

Table 17

Designation	Values	Description
Resend last time command:		
After download		After downloading application program:
	no	do not send current channel status
	Yes	always send the current channel status
After restoration of bus supply		This applies to the following events: • KNX reset. • Return of bus voltage
	yes	The current channel status should not always be sent after bus restoration.
	no	Do not send if one of these events occurs.

Continuation:

Designation	Values	Description
After changing the time		This applies to the following events: • Time/date are adjusted via objects • Time/date are adjusted via DCF or GPS time • Time is adjusted on the menu • Date is adjusted on the menu • Easter function was changed • Summer/winter time changeover • Summer/winter rule has been selected • Own summer/winter rule changed • Time zone has been changed • Coordinates with time zone have been changed
	no	Do not send if one of these events occurs.
	Yes	Always send if one of these events occurs.
	only with status change	Only send channel status if it has been changed by one of these events.
After programming/deleting a time command		This applies to the following events: • All programs on the channel are deleted • One program has been deleted • One program has been changed • All the programs on all the channels have been deleted • Holidays have been manually deleted • Holidays have been reentered
	no	Do not send if one of these events occurs.
	Yes	Always send if one of these events occurs.
	only with status change	Only send channel status if it has been changed by one of these events.

Continuation:

Designation	Values	Description
After changing a special program		This applies to the following events: • a special program has been started via an object • a special program has been started manually • a special program has been changed manually
	no	Do not send if one of these events occurs.
	Yes	Always send if one of these events occurs.
	only with status change	Only send channel status if it has been changed by one of these events.

3.3.2.7 Parameter pages "*Threshold channel C9..C12*"

The threshold channel block forms a separate unit that is completely independent of the switching times.

Principle:
A value is received from the bus and compared with the set threshold.
The condition is fulfilled if the value is higher than the set threshold.
In turn, not fulfilled if the value is below it.

The response of the output objects to fulfilling/not fulfilling the condition is set on the *Objects* parameter page.

The channel status (condition fulfilled/unfulfilled) for each threshold channel can also be configured as input value for logic channels (see below, The logic channels).

The switching channels are activated on the *General* parameter page.

Table 18

Designation	Values	Description
Type of threshold value object	***object type: Per cent (DPT 5.001)*** *Object type: Counter value 0..255 (DPT 5.010)* *Object type: Counter value 0..65535 (DPT 7.001)* *Object type: EIS5 e.g. CO2, brightness, etc. (DPT 9.xxx)*	Value type for threshold.
Parameter for *Percent* threshold object		
Threshold value (in %)	*1..99* Default = ***50***	Desired threshold value as percentage.
Hysteresis (as %)	*1..99* Default = ***5***	Prevents frequent switching after small changes in readings. The hysteresis is uniformly negative for all threshold types, e.g. threshold 50, hysteresis 5 means: Switch on at > 50 and switch off at 50 – hysteresis = 45
Parameter for threshold value object *Counter value 0..255*		
Threshold value	*1..254* Default = ***127***	Desired threshold value as 1 byte number from 1 to 254.
Hysteresis	*1..254* Default = ***5***	The hysteresis prevents frequent switching after small changes in readings.

Continuation:

Designation	Values	Description
Parameter for threshold value object *Counter value 0..65535*		
Threshold value	*1..65534* Default = ***1000***	Desired threshold value as 2 byte number from 1 to 65534.
Hysteresis	*1..65534* Default = ***5***	The hysteresis prevents frequent switching after small changes in readings.
Parameter for threshold value object *EIS5 (e.g. CO_2, brightness…)*		
Threshold value format: *(-000.00..9999)*	-9999..99999 Default = ***20.0***	Desired threshold value as decimal number with prefix. Format: A maximum of 5 characters are permitted including decimal point and prefix. Examples with five characters: -9999 -9.99 10.35 100.6 99999 etc.
Hysteresis format: *0.00..9999*	*0.00..9999* Default = ***1.0***	The hysteresis prevents frequent switching after small changes in readings. Format: Max. 4 characters, positive numbers only. Examples: 0.01 99.9 9999
Common parameters		
Delay with exceeding	***None,*** *5 s, 10 s, 20 s, 30 s, 1 min, 2 min, 3 min, 5 min, 10 min, 15 min, 20 min*	The channel sends immediately. The channel only sends after set delay is completed.
Delay with falling below	***none*** *5 s, 10 s, 20 s, 30 s, 1 min, 2 min, 3 min, 5 min, 10 min, 15 min, 20 min*	The channel sends immediately. The channel only sends after set delay is completed.

3.3.2.8 Parameter pages "*Objects*"

The response to falling below or exceeding the set threshold is configured here.

Table 19

<table>
<tr><th>Designation</th><th>Values</th><th>Description</th></tr>
<tr><td>Telegram type C9.1</td><td>Switching command

Priority

value</td><td>1 bit ON/OFF

2-bit
<table><tr><th>Function</th><th>value</th></tr><tr><td>Priority inactive (no control)</td><td>0 (00_{bin})</td></tr><tr><td>Priority ON (control: enable, on)</td><td>3 (11_{bin})</td></tr><tr><td>Priority OFF (control: disable, off)</td><td>2 (10_{bin})</td></tr></table>1-byte 0 .. 255</td></tr>
<tr><td>When exceeding the threshold</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is fulfilled.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the first output object on the channel with fulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
<tr><td>When underrunning threshold</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is unfulfilled.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the first output object on the channel with unfulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
</table>

Continuation:

<table>
<tr><th>Designation</th><th>Values</th><th>Description</th></tr>
<tr><td>Should a second telegram be sent?</td><td>Yes
no</td><td>If yes is selected, further parameters and a second transmission object appear.
It can be used to send 2 different telegrams at the same time on the same channel.
The cycle time and the disabling behaviour apply to both objects.</td></tr>
<tr><td>Telegram type C9.2</td><td>Switching command

Priority

value</td><td>Second output object on channel
1 bit ON/OFF

2-bit
<table><tr><th>Function</th><th>value</th></tr><tr><td>Priority inactive (no control)</td><td>0 (00_{bin})</td></tr><tr><td>Priority ON (control: enable, on)</td><td>3 (11_{bin})</td></tr><tr><td>Priority OFF (control: disable, off)</td><td>2 (10_{bin})</td></tr></table>1-byte 0 .. 255</td></tr>
<tr><td>When exceeding the threshold</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is fulfilled.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the second output object on the channel with fulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
<tr><td>When underrunning threshold</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is unfulfilled.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the second output object on the channel with unfulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
</table>

Continuation:

Designation	Values	Description
Activate lock function	*Yes*	Insert disable parameter and disable object.
	no	No disable function.
Lock telegram	***Disable with ON telegram***	1 = Disable 0 = Cancel disable
	lock with OFF telegram	1 = Cancel disable 0 = Disable*
Response when setting disable	***do not send***	No telegrams when setting disable
	as with unfulfilled condition	Same reaction set as with parameter *If below threshold* (see above).
	as with fulfilled condition	Same reaction set as with parameter *When exceeding threshold* (see above).
Behaviour when cancelling the disable function	*Do not send*	Not automatically resent when the disable function is cancelled
	update channel	The current channel status is sent immediately as soon as the disable function is cancelled
Cycle time (if used)	*every min* *every 2 min* *every 3 min* *every 5 min* *every 10 min* *every 15 min* *every 20 min* *every 30 min* *every 45 min* ***every 60 min***	How often should the telegrams for CX.1 and CX.2 be sent?

3.3.2.9 Parameter pages "*Logic channel C13..C18*"

The logic channel block forms a separate unit that is initially completely independent of the switching times, but they can be included if necessary.
The logic channels can thus be used for a broad range of tasks in the KNX device.
The logic channels are activated on the general parameter page.

Principle:
Up to four 1 bit input values can be logically linked to each other.

These input values can be:

- Input objects
- Status of switching channels (On / Off)
- Status of threshold channels (fulfilled/unfulfilled)
- Link result of other logic channels (a logic channel cannot be connected with itself)

IMPORTANT:
Activated channels only should be used as input values (parameter page *General*).

The response of the output objects to fulfilling/not fulfilling the condition is set on the *Objects* parameter page.

Table 20

Designation	Values	Description
Type of link		Selection of logical link between 1-bit input values (see below)
	AND	2 to 4 inputs
	OR	2 to 4 inputs
	XOR	2 inputs
Use input 1	***Yes***	Input is used.
	Yes, inverted	Input appears inverted.
Use input 2	***Yes***	See above, input 1
	Yes, inverted	
Use input 3	***No***	Input is hidden.
	Yes	See above.
	Yes, inverted	
Use input 4	***No***	Input is hidden.
	Yes	See above.
	Yes, inverted	
Input value for input 1	*Input object*	First input object on channel (e.g. object 79 for C13)
	Status C1 Status C2 Status C3 Status C4 Status C5 Status C6 Status C7 Status C8	Status of switching channel (On/Off).
	Status threshold channel C9 Status threshold channel C10 Status threshold channel C11 Status threshold channel C12	Status of threshold channel (threshold exceeded/not exceeded).
	Link result logic channel C13[1] *Link result logic channel C14*[2] *Link result logic channel C15*[3] *Link result logic channel C16*[4] *Link result logic channel C17*[5] *Link result logic channel C18*[6]	Link result of another logic channel (a logic channel cannot be connected with itself)
Input value for input 2	*See above, Input value for input 1*	Second input object on channel See above.

Continuation:

Designation	*Values*	Description
Input value for input 3	*See above, Input value for input 1*	Third input object on channel See above.
Input value for input 4	*See above, Input value for input 1*	Fourth input object on channel See above.

(1) If C13 unavailable , (2) If C14 unavailable, (3) If C15 unavailable
(4) If C16 unavailable , (5) If C17 unavailable, (6) If C18 unavailable

3.3.2.10 Parameter pages "*Objects*"

The reaction to fulfilling or not fulfilling the link is configured here.

Table 21

<table>
<tr><th>Designation</th><th>Values</th><th>Description</th></tr>
<tr><td>Telegram type C13.1</td><td>Switching command

Priority

value</td><td>1 bit ON/OFF

2-bit
<table><tr><th>Function</th><th>value</th></tr><tr><td>Priority inactive (no control)</td><td>0 (00_{bin})</td></tr><tr><td>Priority ON (control: enable, on)</td><td>3 (11_{bin})</td></tr><tr><td>Priority OFF (control: disable, off)</td><td>2 (10_{bin})</td></tr></table>1-byte 0 .. 255</td></tr>
<tr><td>If the condition is met</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is fulfilled, i.e. link result = 1.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the first output object on the channel with fulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
<tr><td>If the condition is not met</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is not fulfilled, i.e. link result = 0.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the first output object on the channel with unfulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
</table>

Continuation:

<table>
<tr><th>Designation</th><th>Values</th><th>Description</th></tr>
<tr><td>Should a second telegram be sent?</td><td>Yes
no</td><td>If yes is selected, further parameters and a second transmission object appear.
It can be used to send 2 different telegrams at the same time on the same channel.
The cycle time and the disabling behaviour apply to both objects.</td></tr>
<tr><td>Telegram type C13.2</td><td>Switching command

Priority

value</td><td>Second output object on channel
1 bit ON/OFF

2-bit
<table><tr><th>Function</th><th>value</th></tr><tr><td>Priority inactive (no control)</td><td>0 (00_{bin})</td></tr><tr><td>Priority ON (control: enable, on)</td><td>3 (11_{bin})</td></tr><tr><td>Priority OFF (control: disable, off)</td><td>2 (10_{bin})</td></tr></table>1-byte 0 .. 255</td></tr>
<tr><td>If the condition is met</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is fulfilled.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the second output object on the channel with fulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
<tr><td>If the condition is not met</td><td>no telegram
send following telegram once
send cyclically</td><td>Send response if channel condition is unfulfilled.</td></tr>
<tr><td>Telegram</td><td>

ON
OFF
no priority
priority, ON (down)
priority, OFF (up)
Telegram 0 .. 255</td><td>Type of telegram for the second output object on the channel with unfulfilled condition:
For telegram type Switching command.

For telegram type Priority.

For telegram type Value.</td></tr>
</table>

Continuation:

Designation	Values	Description
Activate lock function	*Yes*	Insert disable parameter and disable object.
	no	No disable function.
Lock telegram	***Disable with ON telegram***	1 = Disable 0 = Cancel disable
	lock with OFF telegram	1 = Cancel disable 0 = Disable*
Response when setting disable	***do not send***	No telegrams when setting disable
	as with unfulfilled condition	Same reaction set as in parameter *If the conditioned has not been fulfilled* (see above).
	as with fulfilled condition	Same reaction set as in parameter *If the conditioned has been fulfilled* (see above).
Behaviour when cancelling the disable function	*Do not send*	Not automatically resent when the disable function is cancelled
	update channel	The current channel status is sent immediately as soon as the disable function is cancelled
Cycle time (if used)	*every min* *every 2 min* *every 3 min* *every 5 min* *every 10 min* *every 15 min* *every 20 min* *every 30 min* *every 45 min* ***every 60 min***	How often should the telegrams for CX.1 and CX.2 be sent?

4 Typical applications

These typical applications are designed to aid planning and are not to be considered as an exhaustive list.
It can be extended and updated as required.

4.1 Simple lighting control

One room lighting system with 2 separate switching circuits (C1, C2) should be switched according to time.

4.1.1 Devices:

- TR 648 top2 KNX (6489210)
- RMG 4 I (4930210)

4.1.2 Overview

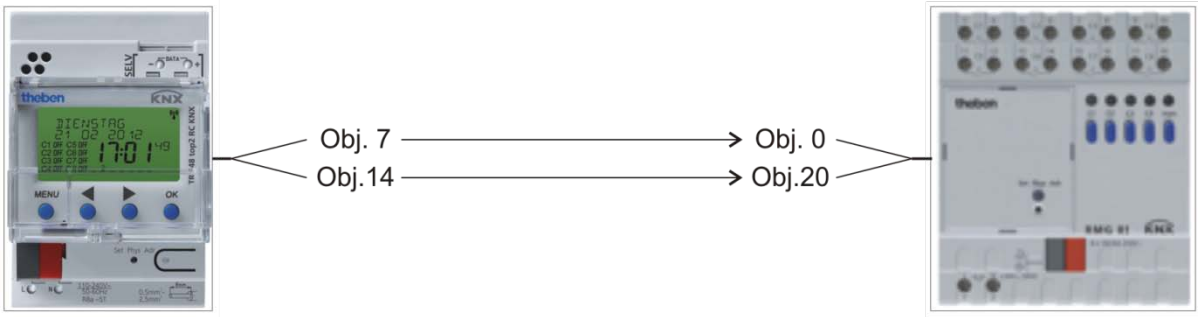


Figure 2

4.1.3 Objects and links

Table 22

No.	TR 648 top2 KNX Object name	No.	RMG 4 I Object name	Comment
7	*C1.1 Switching channel - switching*	0	*RMG 4 I channel 1 – switching object*	-
14	*C2.1 Switching channel - switching*	20	*RMG 4 I channel 2 – switching object*	-

4.1.4 Important parameter settings

Standard or customer-defined parameter settings apply for unlisted parameters.

Table 23: TR 648 top2 KNX

Parameter page	Parameter	Setting
General	*Activate time switch channel C1*	*Yes*
	Activate time switch channel C2	*Yes*
Switching channel C1	*Telegram type C1.1*	*switching command*
	With clock → ON	*ON*
	With clock → OFF	*OFF*
Switching channel C2	*Telegram type C1.1*	*switching command*
	With clock → ON	*ON*
	With clock → OFF	*OFF*

Table 24: RMG 4 I

Parameter page	Parameter	Setting
General	*Type of basic module*	*RMG 4 I*
RMG 4 I channel Cx: Function selection	*Channel function*	*Switching On/Off..*
	Activation of function via	*Switching object*
Contact characteristics	*Type of contact*	*NO contact*

4.2 Switching HVAC operating modes

The TR 648 top2 KNX is to take over the changing of HVAC operating modes in an office building.

The thermostat is set to standby mode in the morning via the clock switch switch.
The room is only heated to comfort mode if it is actually occupied.
This function is assumed by a presence detector.
The thermostat is reset to night temperature reduction in the evenings and at the the weekend.

If a window is opened (RAM 713 S, window contact to E1), the thermostat switches to frost protection mode.

4.2.1 Devices:

- TR 648 top2 KNX (6489210)
- RAM 713 S (7139202)
- Cheops drive (7319200)
- Presence detector, e.g. Compact office EIB (order no. 201 9 200)

4.2.2 Overview

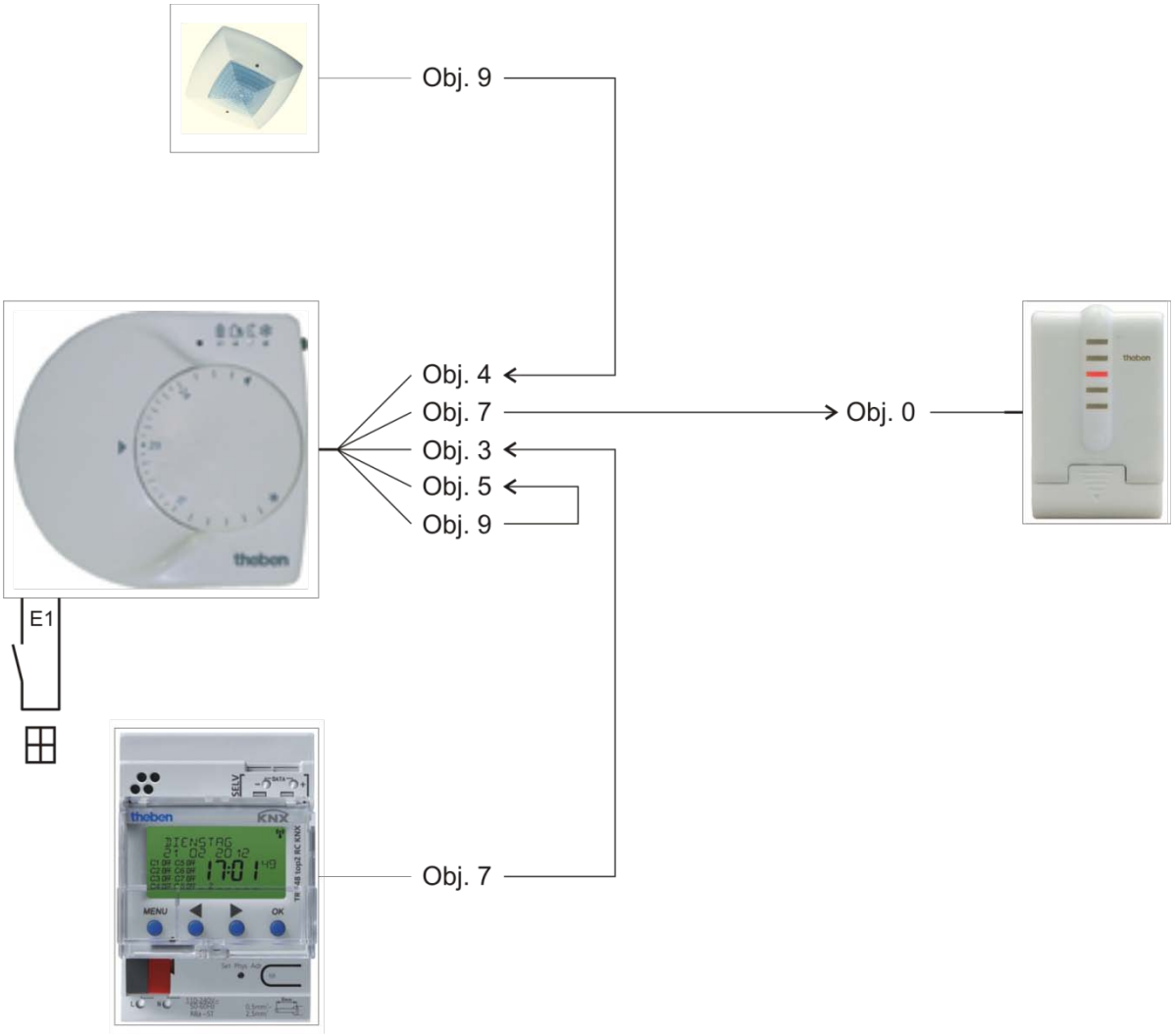


Figure 3

4.2.3 Objects and links

Table 25: Operating mode

No.	TR 648 top2 KNX Object name	No.	RAM 713 S Object name	Comment
7	*C1.1 switching channel – HVAC operating mode*	3	*Operating mode preset*	C1.1 sends the programmed operating mode to the thermostat

Table 26: Window contact

No.	RAM 713 S			Comment
	Object name	No.	Object name	
9	*Switching input 1*	5	*Window position*	Reports the status of the window contact (input E1) to the window object

Table 27: Actuating value

No.	RAM 713 S Object name	No.	Cheops drive Object name	Comment
7	*Heating actuating value*	0	*Approach position*	Actuating value for actuating drive

Table 28: Presence

No.	Compact office EIB Object name	No.	RAM 713 S Object name	Comment
9	*Presence output*	4	*Input for presence signal*	Presence signal for comfort mode if the room is occupied.

4.2.4 Important parameter settings

Standard or customer-defined parameter settings apply for unlisted parameters.

Table 29: TR 648 top2 KNX

Parameter page	Parameter	Setting
General	*Activate time switch channel C1*	*Yes*
Switching channel C1	*Telegram type C1.1*	*HVAC operating mode*
	With clock → ON	*standby*
	With clock → OFF	*night-time temperature reduction*

Program example for the TR 648 top2 KNX: Channel 1, 7:30 ON, 17:30 OFF, Monday to Friday.

Table 30: RAM 713 S

Parameter page	Parameter	Setting
Settings	*Function of external interface*	*active*
Operating mode	*Objects for determining the operating mode*	*New: Operating mode, presence, window status*
	Operating mode after reset	*standby*
	Type of presence sensor	*Presence detector*
	Cyclical transmission of current operating mode	*Not cyclical, only in the event of change*
Input 1	*Function of E1*	*Switching*
	Reaction to closing the contact	*ON (OFF*)*
	Reaction to opening the contact	*OFF(ON*)*
	Send cyclically	*Every 5 minutes*

* Depending on type of window contact. The details in brackets refer to the following case: Window closed → contact closed.

Table 31: ECO-IR 360

Parameter page	Parameter	Setting
General data	*Operating mode*	*Master in single unit operation*
	Presence output	*active*
	Normal or test operation mode	*Standard operation*
Presence output	*Switch-on delay time presence*	*5 minutes*
	Behaviour at start of presence	*Send ON telegram*
	Behaviour at end of presence	*Send OFF telegram*

Cheops drive:
The standard parameter settings can be used here.

5 Appendix

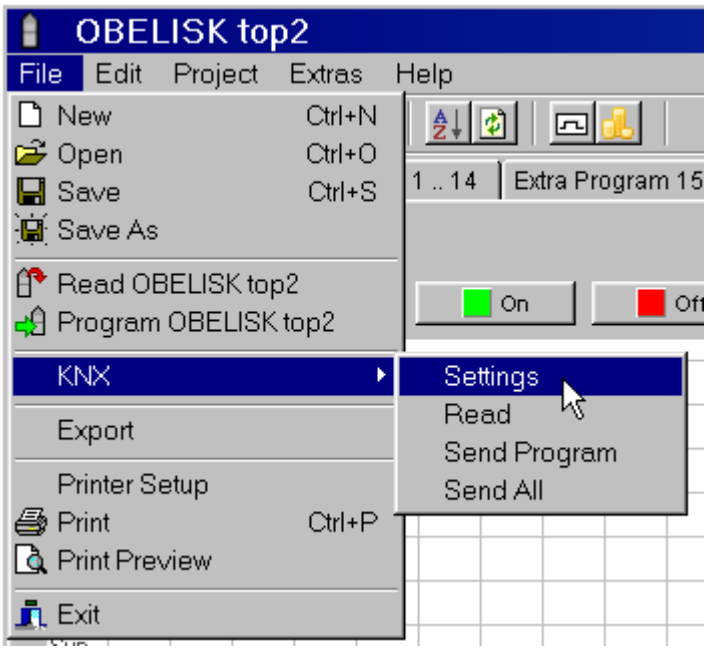
5.1 Program switching times via the KNX bus

Obelisk PC software can be used to program and read out switching programs (and Astro programs) via the KNX bus.

The PC (via a KNX interface) has to be connected to the KNX device and additional required software components have to be installed (see below).

5.1.1 Configuration

The configuration of the interface and the input of the clock's physical address are completed on the menu - File/KNX/Settings.



Important:
If the application software is deactivated via the ETS (→Release) or has not been downloaded. (→First use) programming via OBELISK software is not possible.

5.1.2 Data exchange

Data can be exchanged with the clock via the KNX menu item.

Menu item	Description
Read	This reads the switching program (all standard and special programs) and all settings (e.g. position, offset, external input, time format etc.) from the clock switch switch to the Obelisk software. **Note:** The reading process can take a while. (≥ 10 min.).
Send program	Copies the switching program (all standard and special programs) from the Obelisk software to the clock switch switch.
Send all	Copies the switching program (all standard and special programs) and all clock switch switch settings (e.g. Position, offset, external input, time format etc.) from the Obelisk software to the clock switch switch.

5.1.3 Requirements for KNX program transmission

For bus communication, the Falcon driver (*FalconRuntime_V20_ObeliskKNX.msi*) must be installed.
This program is installed on the Obelisk CD in the "Driver" directory.

- **Windows 7 and Vista**

No further software required.

- **Windows XP**

The mandatory requirement for the Falcon driver installation under Windows XP is an existing **Microsoft .NET Framework 2.0 SP2*** or **.NET Framework 3.5 SP1**
(see Settings → System control → Software).

Otherwise, Version 3.5 Service Pack 1 is to be installed (see below).
Version 4 and higher are not suitable.

5.1.3.1 Download Links

.NET Framework 3.5 Service Pack 1 Download (Internet Setup German 2.8 MB):
http://www.microsoft.com/de-de/download/details.aspx?id=22

or:

.NET Framework 3.5 Service Pack 1 Download (Internet Setup English 2.8 MB):
http://www.microsoft.com/en-us/download/details.aspx?id=22

Please read the **instructions** on the aforementioned websites carefully.
The installation file (231 MB) is also available there as a **complete package**.

*.NET Framework 2.0 SP2 is automatically installed with ETS 4.

6 Operating instructions

theben

TR
TR 648 top2 RC-DCF KNX 6489210
TR 648 top2 RC KNX 6489212

Installation and operating instructions
Digital time switch with annual and astronomical program

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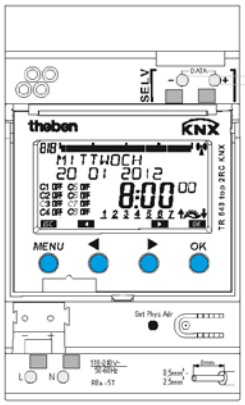


top2 RC–DCF antenna
top2 RC-GPS antenna

TR 648 top2 RC KNX

Contents

2

Basic safety instructions

GB

⚠ WARNING

Danger of death through electric shock or fire!

➢ Installation should only be carried out by a qualified electrician!

- The device is designed for installation on DIN top hat rails (in accordance with EN 60715) and corresponds to type 1 STU in accordance with IEC/EN 60730-2-7 resp. 60730-1
- The professional installation of bus lines and commissioning of devices requires compliance with the provisions of EN 50428 for switches or similar installation equipment for use in building construction technology. Tampering with, or making modifications to, the device invalidates the guarantee

Designated use

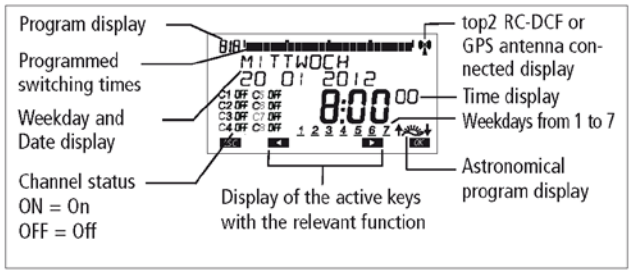
- The time switch can be used for lighting, bell systems, ventilation etc.
- Only use in enclosed dry spaces (device); antenna is installed in the open-air

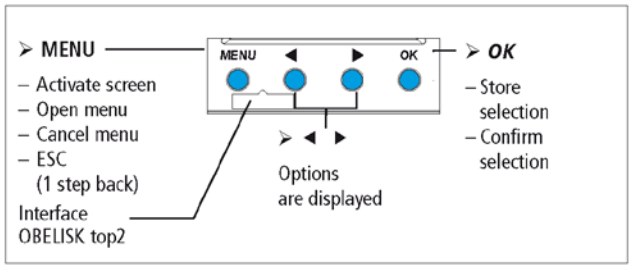
Disposal

Dispose of device and batteries separately in an environmentally sound manner

3

Screen and keys





4

Operating instructions

1. Read text lines
Text represents query

2. Make a decision

YES	NO
Confirmation	Amend/ change
Press *OK*	Press ◄ ►

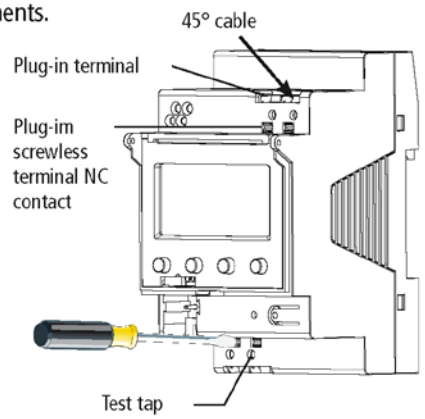
Connection/installation

GB

⚠ WARNING

Warning, danger of death through electric shock!

- Must be installed by qualified electrician!
- Disconnect power source.
- Cover or shield any adjacent live components.
- Ensure device cannot be switched on!
- Check power supply is disconnected.
- Earth and bypass.
- Observe SELV on data bus.



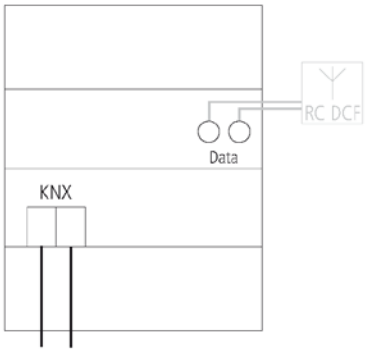
Connect cable

- Strip cable by 8 mm (max. 9 mm).
- Insert cable at 45° in the open terminal (2 cables per terminal position possible).
- Only with flexible wires: To open the plug-in screwless terminal, press screwdriver downwards.

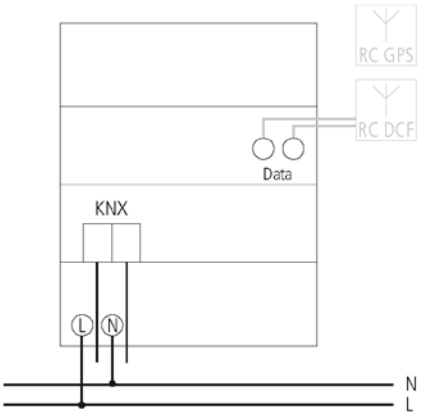
5

Connection

TR 648 top2 RC-DCF KNX



TR 648 top2 RC KNX



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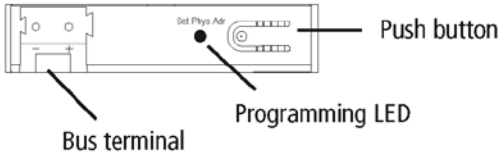
Bus connection

- Insert bus line in bus terminal on the front of the device.
- Ensure correct polarity.



Program physical address

- Press push button on front of device.
  → The programming LED lights up.
  → The device is in program mode.

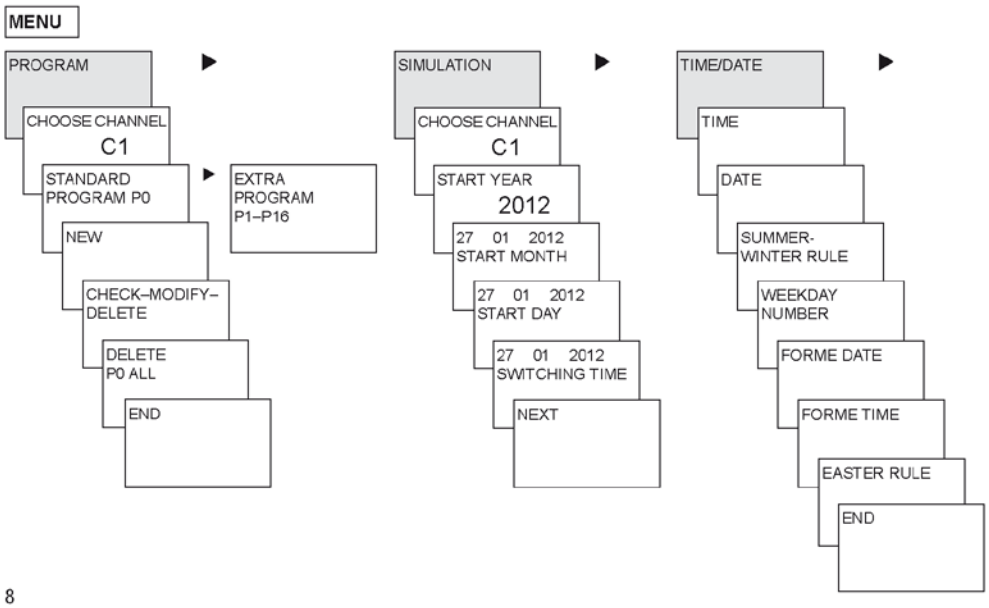
Start-up, diagnostics and configuration are handled by ETS 3 and 4 (KNX tool software).

RESET

- Press the 4 keys simultaneously. **ENGLISH** is displayed.
- Then select **KEEP PROGRAM** or **DELETE PROGRAM**.

7

Overview of menu selection



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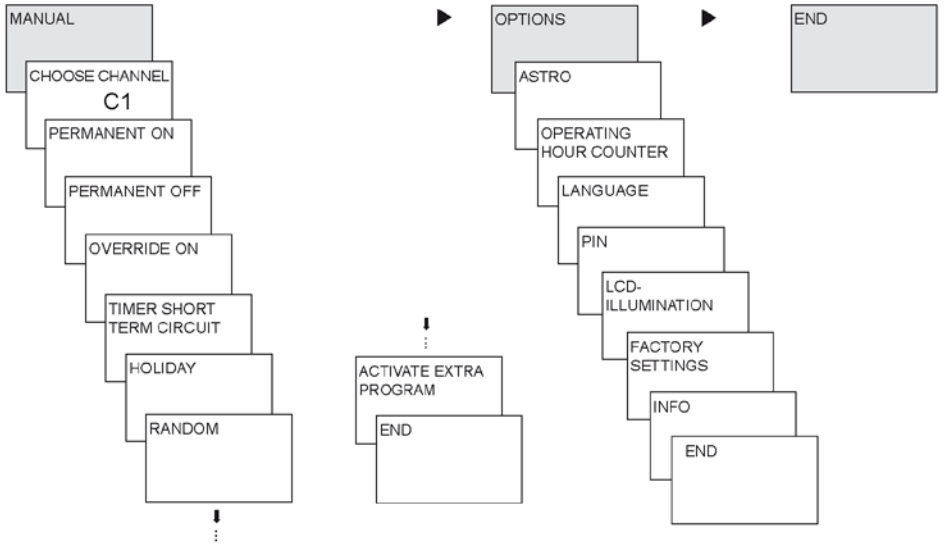


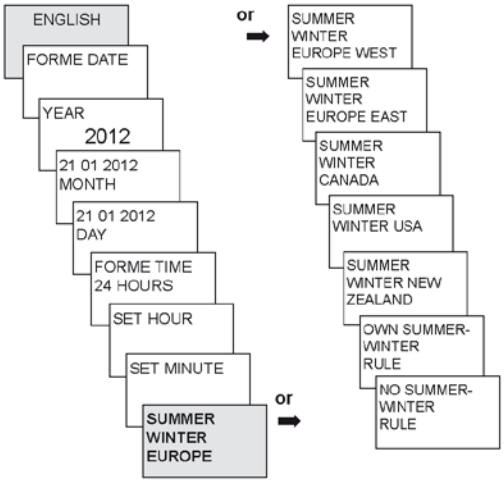
Initial start-up

Set date, time and summer/ winter time rule

➢ Press required key and display follows on screen (see figure).

You can connect the **antenna top2 RC-DCF** (9070410) or the **antenna top2 RC-GPS** (9070610) (only TR 648 top2 RC KNX) in order to synchronise the time switch via the DCF/ GPS time signal. With correct reception the synchronisation occurs automatically after a few minutes.

Settings must be made via the ETS if the antenna is connected. The settings can be activated via the ETS on the KNX bus.
Settings do not have to be made if the date and time were received via GPS/DCF or the KNX bus.



10

Time switch programs, astronomical programs

GB

With the digital 365-day time switch TR 648 top2 KNX (8 channel time switch) the time switch or astro programs can be programmed and switched optionally for each channel.

Time switch programs	Astro programs
Time switch function – 1 **Standard program** P0 (Weekly program with switching times, pulse and cycle times) – 16 **Extra programs** consisting of: 14 Extra programs P1–P14 (Weekly programs with switching times, pulse and cycle times with different adjustable date ranges (fixed date range, date dependent on Easter etc.), with extra program P15 (Fix ON) and extra program P16 (Fix Off) (with adjustable date ranges)	The astro function can be activated instead of the time switch function for each channel – 1 **Astro standard program** P0 (with fixed on/off times, weekly program) – 16 **Extra programs** consisting of: 14 Astro extra programs P1–P14 (with fixed on/off times, weekly program) with different adjustable date ranges (fixed date range etc.), with extra program P15 (Fix ON) and extra program P16 (Fix Off) (with adjustable date ranges)

A channel can be defined as an astro channel in: MENU → Options → Astro → Astro settings → choose channel → change to astro program

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Time switch program

Program switching time in the standard program P0

Example: Switch on sports hall lighting from Mon–Fri, 7:30 to 12:00 hrs

- Press **MENU**. **PROGRAM** is displayed.
- Confirm by pressing **OK**. **CHOOSE CHANNEL** is displayed.
- Confirm **CHANNEL 1** by pressing **OK**. **STANDARD PROGRAM P0** is displayed.
- Confirm by pressing **OK**. **NEW** is displayed.
- Confirm by pressing **OK**. **SWITCH TIME** is displayed.
- Confirm by pressing **OK**. Select **ON** (for switch-on times).
- Confirm by pressing **OK**. The display shows **SET HOUR**.
- Use the + or – keys to enter hour, minute, (07:30) and confirm by pressing **OK**. **EVERY DAY** is displayed. Press ▶to select **MONDAY**.
- Confirm by pressing **OK**. **COPY** is displayed.
- Confirm by pressing **OK**. **ADD TUESDAY** is displayed.
- Confirm by pressing **OK** and also confirm the days Wed, Thurs, Fri by pressing **OK**.
- Continue with ▶ to **SAVE** is displayed. Confirm by pressing **OK**.

Repeat all steps for the switch-off time however instead of selecting ON with ▶ select OFF and enter 12:00 for hour and minute.

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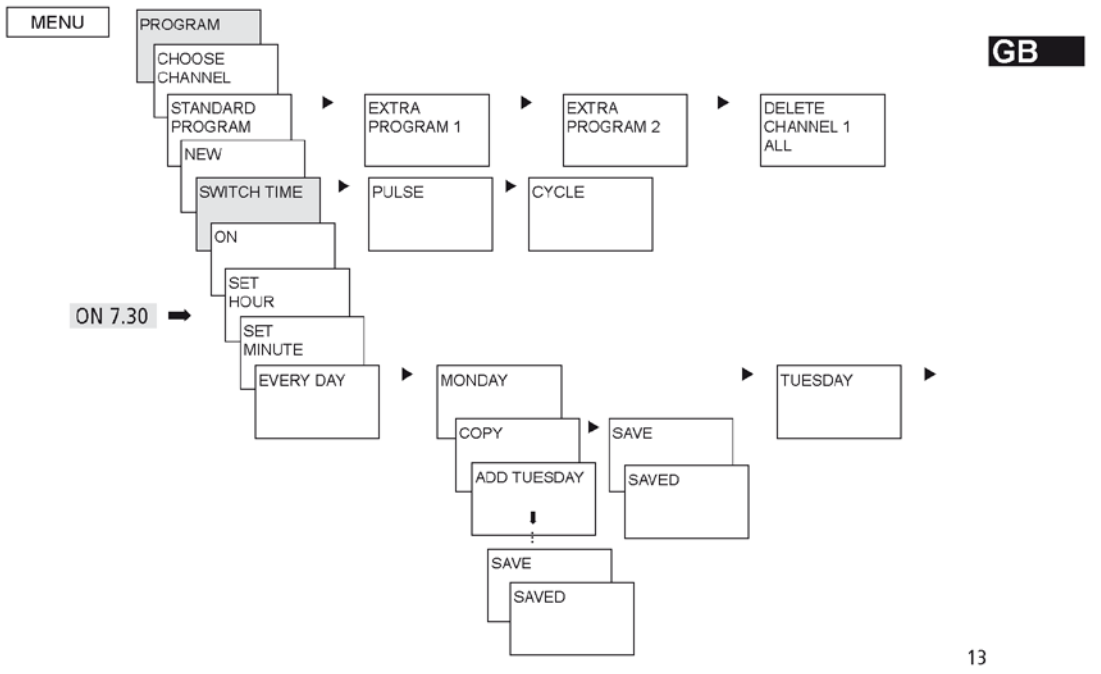
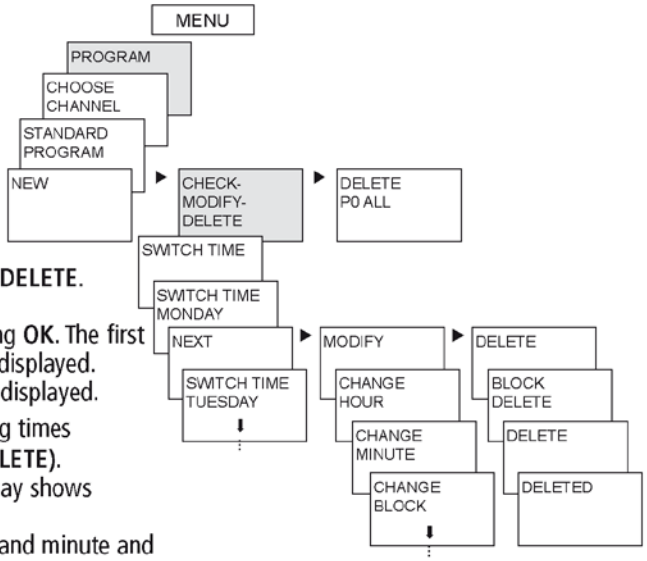


Request/change/ delete switching time

- Press **MENU**. **PROGRAM** is displayed.
- Confirm by pressing **OK**.
- Confirm **CHANNEL 1** by pressing **OK**.
- Confirm **STANDARD PROGRAM P0** by pressing **OK**.
- Use ▶ to select **CHECK-MODIFY-DELETE**.
- Confirm by pressing **OK**.
- Confirm **SWITCH TIME** by pressing **OK**. The first of the entered switching times is displayed.
- Confirm by pressing **OK**. **NEXT** is displayed.

Change or delete individual switching times

- Press ▶ to select **MODIFY** (or **DELETE**).
- Confirm by pressing **OK**. The display shows **CHANGE HOUR**.
- Use the+ or – keys to enter hour and minute and confirm by pressing **OK**.



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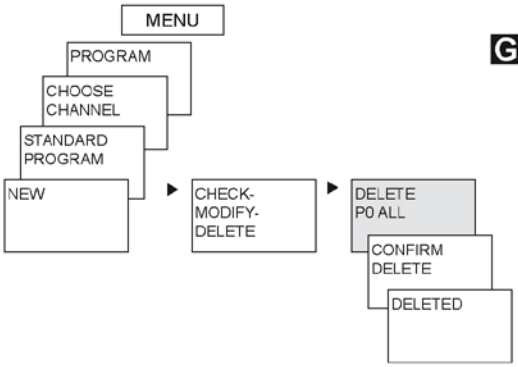
Delete all switching times in the standard program

GB

- Press **MENU**. **PROGRAM** is displayed.
- Confirm by pressing **OK**.
- Confirm **CHANNEL 1** by pressing **OK**. **STANDARD PROGRAM P0** is displayed.
- Confirm by pressing **OK**.
- Use ▶ to select **DELETE P0 ALL**.
- Confirm by pressing **OK**. The display shows **CONFIRM DELETE**.
- Confirm by pressing **OK**. The display shows **DELETED**.



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Pulse time programming

Example: Switch on pause signal on Monday 8:05 hrs for 5 sec

- Press **MENU**. **PROGRAM** is displayed.
- Confirm by pressing **OK**. **CHOOSE CHANNEL** is displayed.
- Confirm **CHANNEL 1** by pressing **OK**. **STANDARD PROGRAM P0** is displayed.
- Confirm by pressing **OK**. **NEW** is displayed.
- Confirm by pressing **OK**. **SWITCH TIME** is displayed.
- Select **PULSE** by pressing ▶.
- Confirm by pressing **OK**. **ON** is displayed.
- Confirm by pressing **OK**. The display shows **SET HOUR**.
- Use the + or – keys to enter hour, minute, second (8:05) and confirm by pressing **OK**. **PULSE LENGTH** is displayed.
- Use the + or – keys to enter the duration of the pulse in minutes and seconds (5 sec). **EVERY DAY** is displayed. Press ▶to select **MONDAY**.
- Confirm by pressing **OK**. **EVERY DAY** is displayed.
- Press ▶ to select **MONDAY**. Confirm by pressing **OK**.
- **COPY** is displayed. Press ▶ to select **SAVE**.
- Confirm by **pressing** OK.

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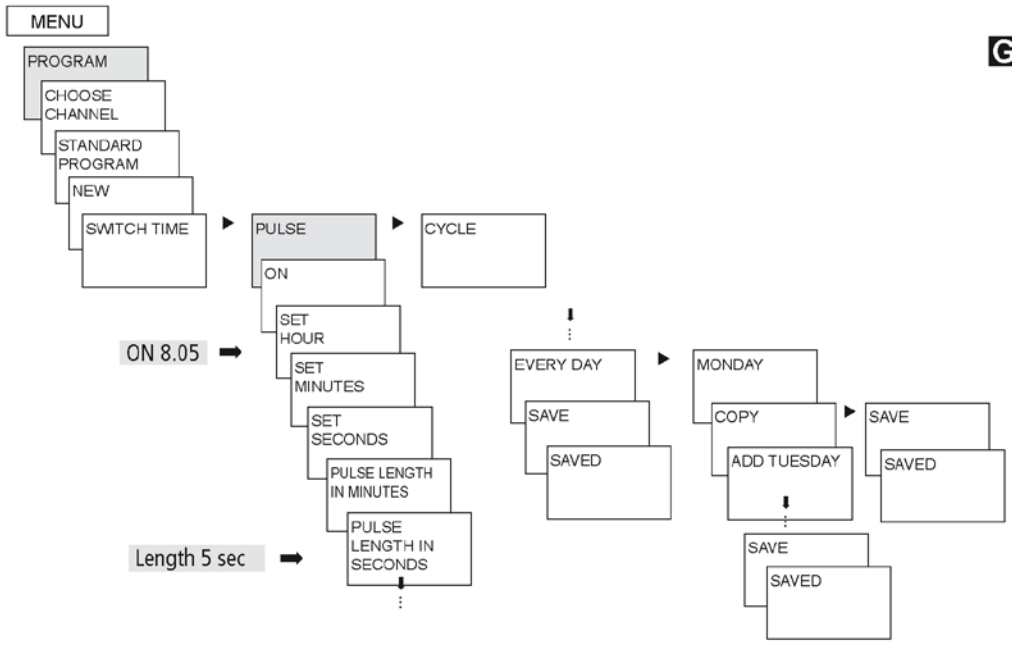

Programme cycle time

In addition to switch-on and switch-off times (switching time) and short time pulses (pulse) cycle times (cycle) can also be programmed. The pulse length (+ pulse pause) is limited to 17 hrs, 59 min, 59 sec

- Cycle times refers to cyclically repetitive time functions such as fan controls, urinal rinses etc.

Example: Switch on water rinsing Monday from 8:00 to 20:30 hrs every 15 min for 20 sec ($8:00^{00}$–$8:00^{20}$ On; $8:15^{00}$–$8:15^{20}$ On; $8:30^{00}$–$8:30^{20}$ On etc.)

Cycle programming
– Start cycle: Monday 8:00 hrs
– Pulse length: 20 sec
– Pause length: 14 min 40 sec
– Cycle end: Monday 20:30:00 hrs

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Standard program and extra programs

GB

- The standard program P0 (weekly program with switching times, pulse and cycle times or astronomical program) is always active however has the lowest priority and can be superimposed by the extra programmes P1–P16.
- In extra programs the following is valid: the higher the number the higher the priority. The extra program 16 has the highest, the extra program 1 the lowest priority.
- Each extra program has an arbitrary number of date ranges available. A extra program becomes active when at least one date range has been set and is not superimposed by another extra program with a higher priority during this period. At the start and end of each date range the hour can also be entered to ensure that the changeover to the respective extra program occurs on each complete hour.
- The following date ranges can be set in parallel:
  – Fixed date (once)
  – Fixed date each year
  – Easter rule or the Orthodox Church rule (81 days before ... 174 days after Easter)

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– Chinese New Year (20 days before ... 20 days after the Chinese New Year)
– Date with serial pattern (Time limit series): Start and end are set and the start repeated according to an adjustable number of days (at the latest after 200 days)
– Weekday rule (e.g. every 3rd Wednesday in September)

Examples of calendar-dependent date ranges:

– **Fixed date range:**
Start on 02.04.2012 at 16:00 hrs, End on 24.04.2012 at 10:00 hrs

– **Annually recurring date range**
Christmas: Start every year on 24.12. at 18:00 hrs, End on 26.12. at 23:00 hrs

– **Easter-dependent date range**
Whit Sunday and Monday: Start every year: 49 days after Easter at 0:00 hrs,
End: 51 days after Easter at 0:00 hrs

– **Date range dependent on the Chinese New Year**
Start each year 1 day before the Chinese New Year. New Year, End 5 days after

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– Date with **serial pattern (Time limit series)**
as from November 2012 to be carried out successively every 2nd week
Start on Monday 01.11.2012 at 0:00 hrs; End on Monday 08.11.2012 at 0:00 hrs,
repeat start after 14 days

GB

– **Date dependent on the weekday etc.**
each month on the 1st weekend from Saturday 06:00 hrs to Sunday 18:00 hrs;
start 1st Sunday each month at 06:00 hrs, duration 36 hours

– **Public holiday settings**
With the help of the PC software OBELISK top2 the public holidays in a country in the set can be set together, individually processed and transferred to the time switch with the memory card OBELISK top2 as date ranges.

- **Extra program P1-14 Time switch channel**
  - Active in the programmed date ranges
  - Switch timings, pulse and cycle times can be entered as week programs
- **Extra program P1-14 Astronomical channel**
  - Active in the programmed date ranges
  - Astronomical times are active (calculated sunrise and sunset times)

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– Fixed switch-offs (e.g. nighttime interruption) and switch-ons can also be entered as weekly program in order to superimpose the astronomical times entirely or partially.

Example: The standard program switches on the street lighting in dependence of the astro times. A nighttime interruption is programmed from 23:00 hrs to 04:00 hrs.
Extra program 1 is active within the date range from April 30, 12:00 hrs until May 12:00 hrs. To ensure that the street lighting remains switched on all night no nighttime interruption is programmed in the extra program 1.

- **Extra program P15**
  - Function: **Fix ON**
  - Active in the programmed date ranges

- **Extra program P16**
  - Function: **Fix OFF**
  - Active in the programmed date ranges

Example: The car park lighting is switched on and off at fixed times or Monday to Friday according to astro times. The extra program P 16 Permanently Off ensures that the car park lighting is not switched on on any public holidays.

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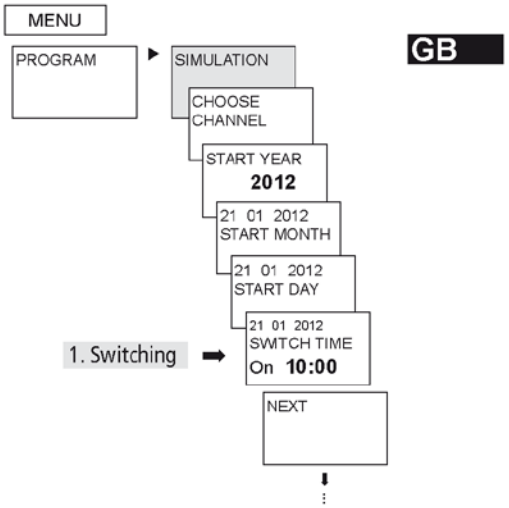
SIMULATION

During the simulation it is a channel-related total request. All channel switching entered (standard and special program, switching times, pulse and cycle programs) are displayed in the time sequence in which they are applied.

In the case of an astronomical channel all astronomical switch-ons and fixed switch-ons / switch-offs are displayed in their time sequence.

➢ Press **MENU** using ▶ select **SIMULATION** and follow the indications on the display in order to request all the switchings applied (see figure).



GB

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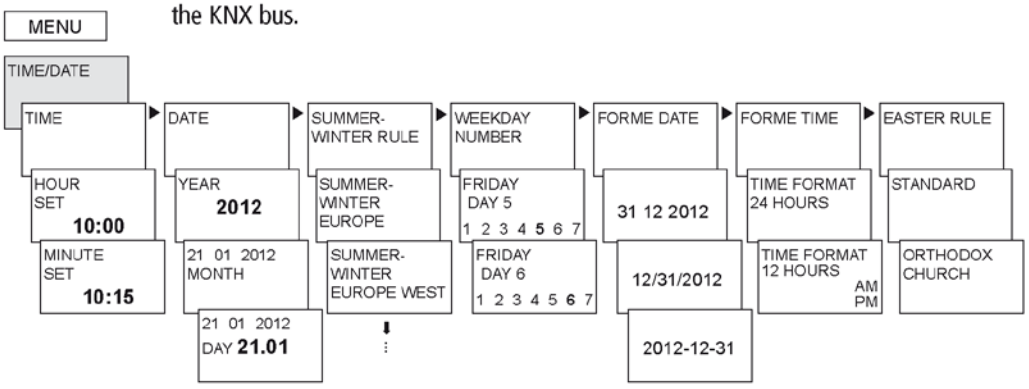
TIME/DATE

In the menu TIME/DATE the TIME, DATE, SUMMER WINTER RULE, WEEKDAY NUMBER, EASTER RULE etc. can be entered/changed in the submenus.

➢ Press **MENU** using ▶ select **DATE/TIME** and follow the indications on the display.

Settings do not have to be made if the date and time are received via GPS/DCF or the KNX bus.



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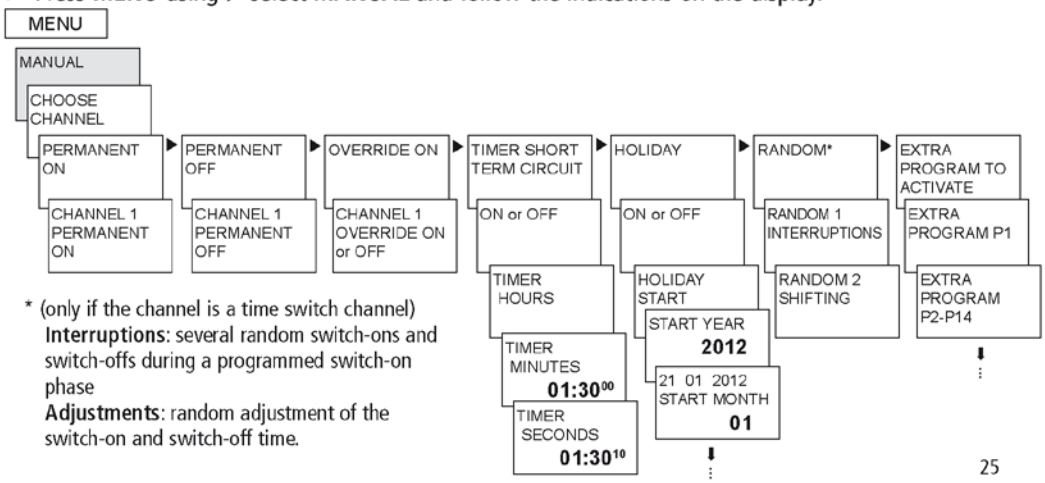
MANUAL

GB

In the MANUAL menu manual switch functions are applied. In the submenus MANUAL, PERMANENT ON/OFF, TIMER SHORT TERM CIRCUIT, HOLIDAY, RANDOM as well as ACTIVATE EXTRA PROGRAM the manual switching can be activated/programmed.

➢ Press **MENU** using ▶ select **MANUAL** and follow the indications on the display.



* (only if the channel is a time switch channel)
Interruptions: several random switch-ons and switch-offs during a programmed switch-on phase
Adjustments: random adjustment of the switch-on and switch-off time.

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Manual and permanent switching

Manual and permanent switching can be set using the menu in **MANUAL**.

Manual switching
Reversing the channel status to the next automatic or programmed switching.

Permanent switching
As long as a permanent switching (on or off) is activated, the programmed switching times are ineffective.

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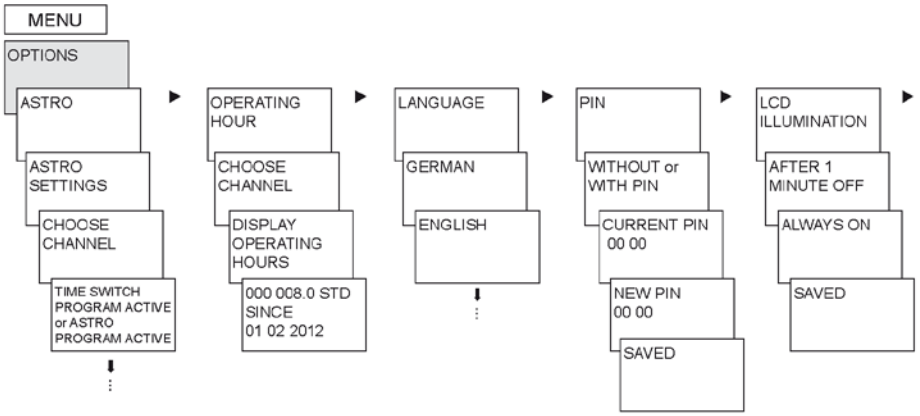
OPTIONS

GB

In the menu OPTIONS the submenus ASTRO, OPERATING HOUR, LANGUAGE, PIN, LCD ILLUMINATION, FACTORY SETTINGS as well as INFO can be requested.

➢ Press **MENU** using ▶ select **OPTIONS** and follow the indications on the display.



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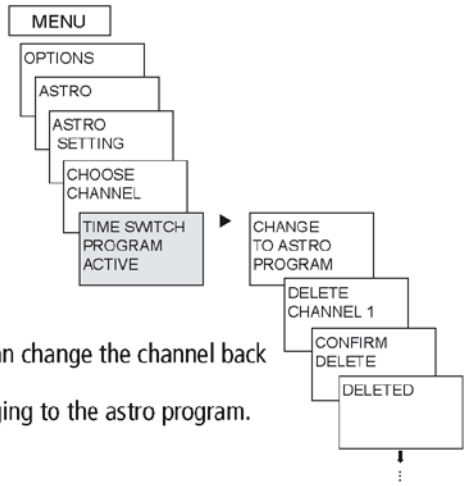
Set ASTRO program

... if a time switch program is active.

➢ Press **MENU** using ▶ select **OPTIONS** and follow the instructions on the display.

You will automatically be taken to the setting for the POSITION data (COUNTRY or COORDINATES input) and the ASTRO SETTINGS (OFFSET and ASTRO MODE).



If an ASTRO program is activated on a channel you can change the channel back to the time switch program.
Programmed switching times are deleted when changing to the astro program.

... if astro times are active.

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In the **OPTIONS** submenu **ASTRO** it is possible – after a channel has been changed to astro program – to request or change astro times, offset, astro mode as well as position (location). If a channel is set as an astro channel the symbol is displayed and the astro times are accessed after the channel selection.

- **ASTRO TIMES**
  Astro time display (sun rise and sunset as well as offset) for the current day
- **OFFSET**
  With the offset (adjustment value) the calculated astro times can be adjusted by max. +/– 2 hrs. This means that the astro on and off switching time can be adapted to local conditions (e.g. mountains, high buildings etc.) or to personal requirements.
- **ASTRO MODE**
  – Evenings **on**, mornings **off**
  At sunset it switches **on**, at sunrise it switches **off** (e.g.: street lighting)
  – Evenings **off**, mornings **on**
  At sunset it switches **off**, at sunrise it switches **on** (e.g.: Terrarium)
  – **Astro pulse**: Evenings and mornings, only mornings or only evenings; pulse duration max. 59 min, 59 sec)
- **POSITION**
  – setting of the location using **coordinates** (longitude/latitude, time zone) or **country/city**
  – With the memory card OBELISK top2 up to 10 more cities (= **Favourites**) can be added
  – Own astro table (with OBELISK top2-program)
  – Automatic setting if antenna top2 RC-GPS is connected (only for RC devices) (settings must be made via the ETS if the antenna is connected)

GB

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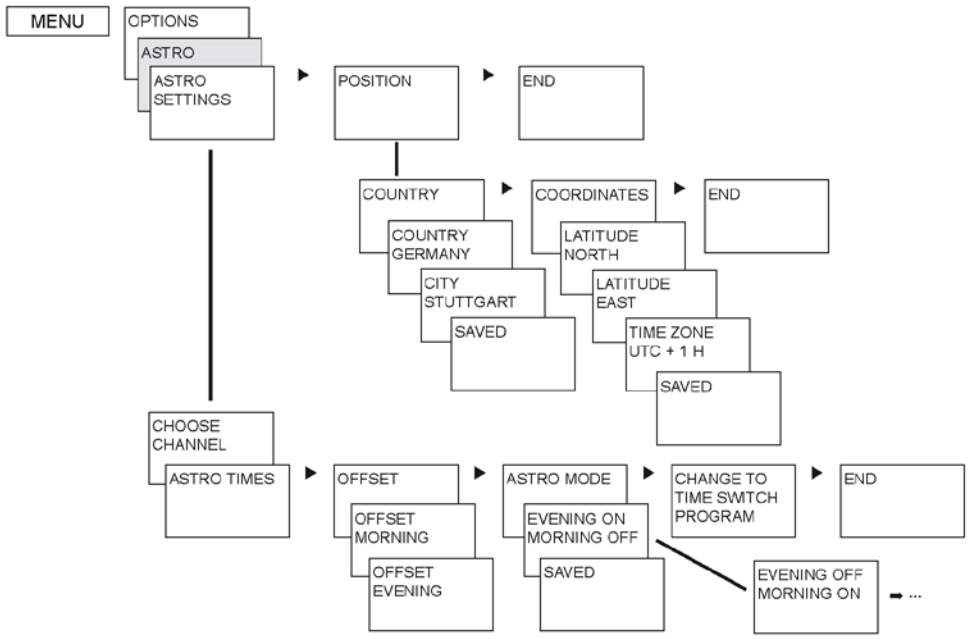

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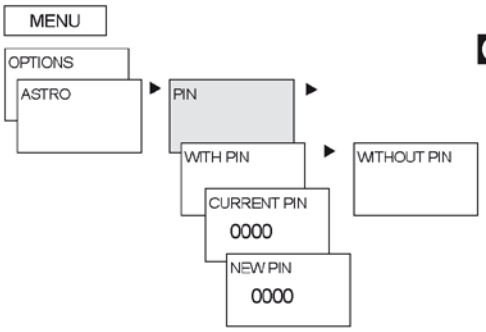
Enter PIN code

The **PIN-Code** is set in **OPTIONS** via the menu.
If you have lost your PIN call the Theben Hotline.



GB

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Time signal received with antenna top2 RC-DCF or antenna top2 RC-GPS

- The time signal can be received via the antenna or the KNX bus. Settings must be made via the ETS if antennas are connected.
- Suitable antenna: **antenna top2 RC-DCF** (907 0 410) or **antenna top2 RC-GPS** (907 0 610)
- By connecting the antenna top2 RC-DCF or GPS the time switch can be automatically synchronised via the DCF or GPS time signal. The time zone can be individually set. Upon receipt of GPS data the GPS coordinates are also transferred to the time switch.
- After connection to the power supply or resetting there is change to the automatic display after 70 sec, as soon as the DCF or GPS time signal has been received.
- **Align antenna top2 RC–DCF** in the direction of Frankfurt am Main (best reception is achieved by installing on the outside of the building).
- **Follow advice in the top2 RC-DCF or GPS antenna operating instructions.**

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NOTE

- When connecting ensure correct polarity.
- Observe maximum cable length of 100 m.
- Align the radio antenna so that the green LED flashes once a second.
- A maximum of 5 365-day time switches can be connected to one antenna.

Setting time zones

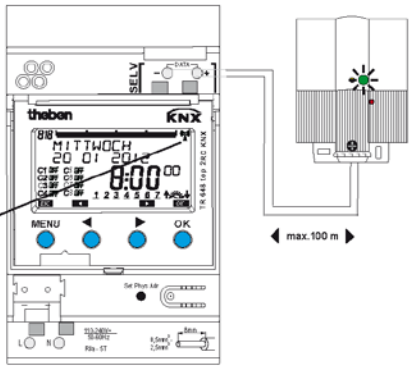
After successful synchronisation, the time zone can be altered in the TIME/DATE menu option.

- In the submenu TIME (display: SET HOUR) correct the applicable local time (time zone).

Reception of the DCF-/GPS time signal:
Display: RC (Radio Control) + Y

No reception of the DCF-/GPS time signal:
Display: Y

No connection to antenna:
Display: no RC, Y



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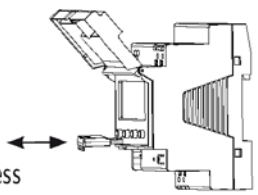
OBELISK top2 memory card

Use memory card (see fig.)

- Insert memory card in the time switch.
- Read / read out saved switching times and device settings in the time switch or start Obelisk program.
- Remove memory card OBELISK top2 (No. 907 0 404) after copying and store in the cover. Avoid mechanical stress or dirtying with other storage/transport methods.

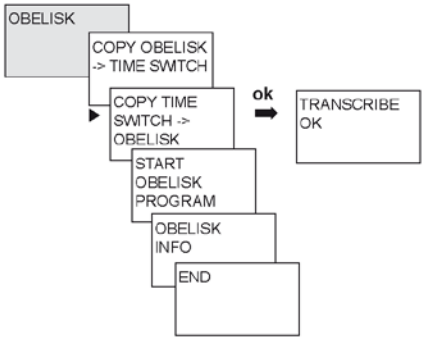


Copy OBELISK → Time switch

This copies the switching program (all standard and special programs) and optionally all time switch (e.g. Position, offset, external input, time format etc.) from the memory card in the time switch.

Copy TIME SWITCH → OBELISK

This copies all switching programs and settings from the time switch to the memory card



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Technical data

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- Operating voltage: 110–240 V AC, –15 %/+10 %
- Frequency: 50–60 Hz
- Power consumption: typ. 1 W
- Standby min.: 0,8 W
- Data output: Safety Extra-Low Voltage (SELV)
- Permissible ambient temperature: –5 °C ... +45 °C
- Protection class: II in accordance with EN 60730-1 subject to designated installation
- Protection rating: IP 20 in accordance with EN 60529
- Time accuracy: ≤0,5 s/day at 25 °C
- Power reserve: 8 years (lithium cell) at +20 °C
- Pollution degree: 2
- Rated impulse withstand voltage: 4 kV
- Power supply on the DATA bus: 100 mA (maximum power on the DATA bus: 500 mA)
- Max. cable cross-section: 2,5 mm²
- Operating voltage KNX: bus voltage
- Bus ≤10 mA
- Cable length: 100 m

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Service address/Hotline

Service address

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The current OBELISK top2 PC software (with time zone map) and the online version of the operating manual are available at
www.theben.de